

PRELIMINARY DATA SUMMARY

January 1991

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Measurements and Analysis work units at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height of 7.6 m above the National Geodetic Vertical Datum (NGVD). In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Michael W. Leffler at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

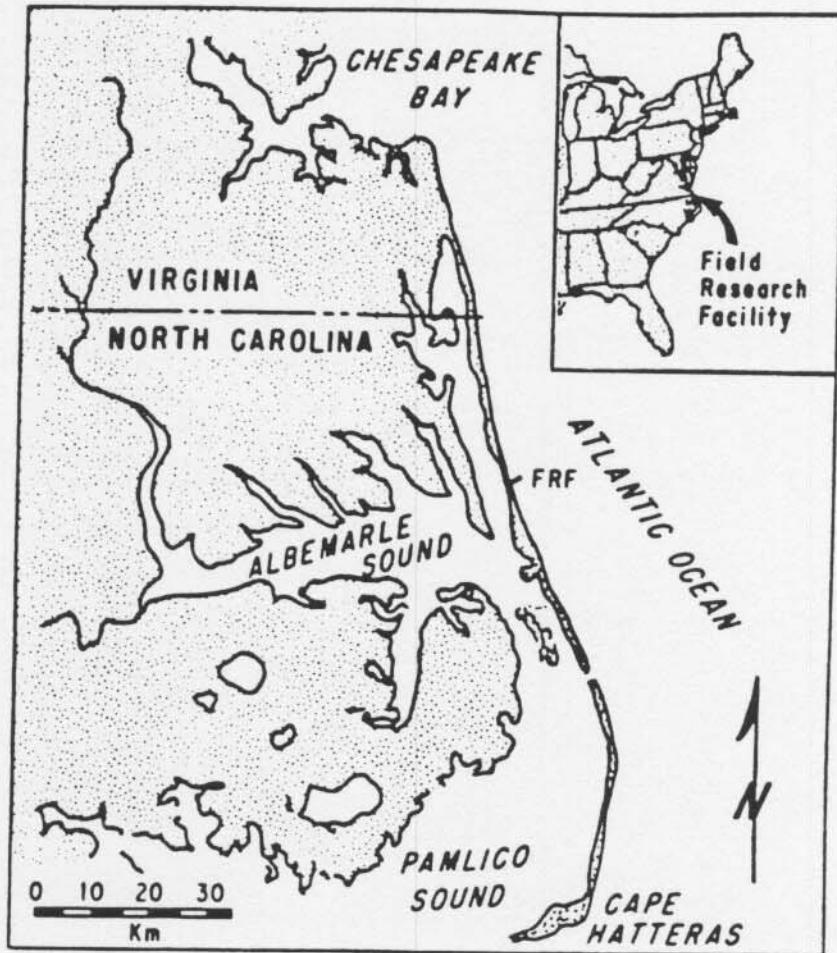


Figure 1. FRF location map

Table 1: Instrument Status/Data Availability

JAN 1991

Gage ID	Description/Remarks	Depth at Sensor		Day of the month																																										
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1												
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*					
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*					
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*					
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
932	Anemometer at seaward end of pier Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
645	Baylor staff at station 7+80 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
625	Baylor staff at station 18+60 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
630	Waverider buoy 6.0 km offshore	Approx. 23 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
519	Current meter 320 m north of FRF pier (0.9 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Supplemental Observations (daily oceanographic and meteorological observations)		Daily observation	/	/	*	/	/	/	*	/	/	*	/	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		

Gage Status	Daily Observation	Analog Record	Data Collected
Operational = *	Complete = *	Complete = *	All = *
Partial = /	Partial = /	Partial = /	Partial = /
Non-Operational = -	None = -	None = -	None = -

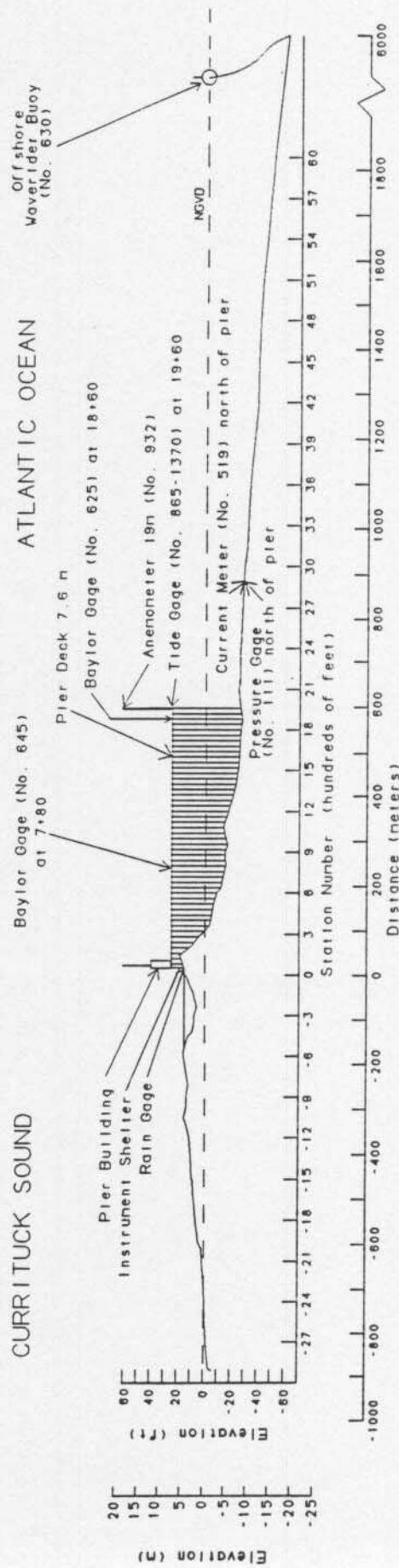
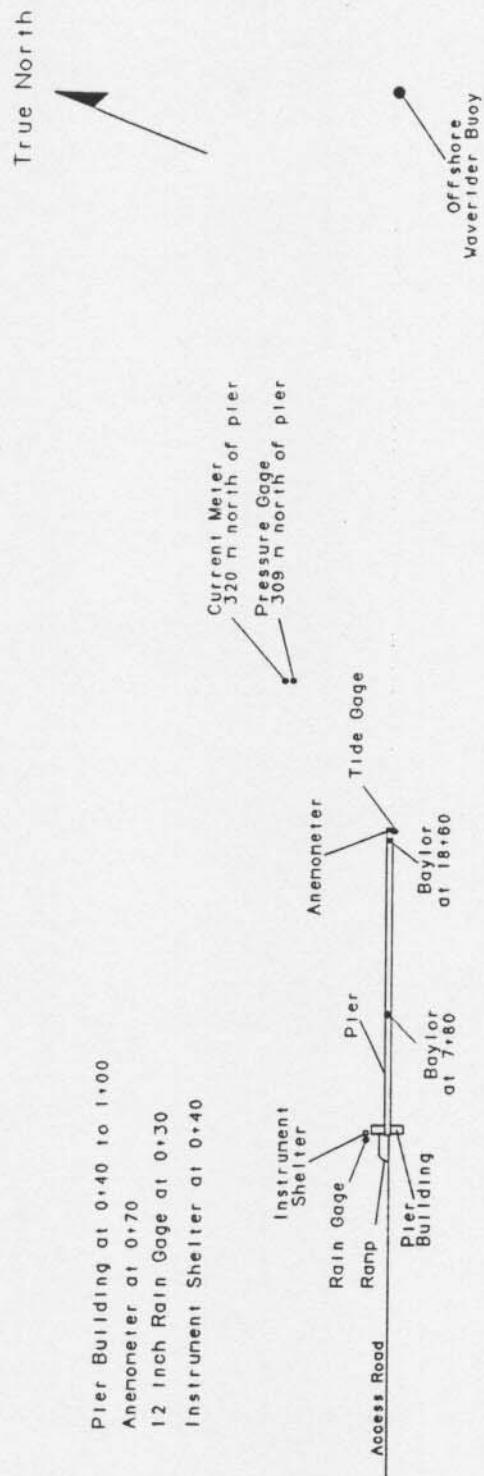


Figure 2. Instrument locations at FRF (all elevations from NGVD, all distances from FRF baseline).

PART III: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

Winds were measured at the end of the pier at an elevation of 19 m (Figure 2) using a Weather Measure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Temperature and atmospheric pressure means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -
 $mm \times .03937 = in.$
2. Millibars (mb) to inches of mercury (in. Hg) -
 $mb \times 0.02953 = in. Hg$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

Table 2: Meteorological Data

Jan 1991

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
1	100	10	22	7.1	1029.7	0
	700	10	33	6.7	1030.4	0
	1300	8	24	9.3	1028.7	0
	1900	9	12	9.9	1026.7	0
2	100	8	346	9.7	1024.0	0
	700	8	351	10.0	1020.6	8
	1300	11	336	8.4	1020.3	13
	1900	6	323	7.8	1021.6	0
3	100	5	318	6.9	1021.9	0
	700	3	320	4.8	1023.6	0
	1300	3	345	9.3	1023.0	0
	1900	4	68	9.0	1024.0	0
4	100	5	351	7.4	1025.0	6
	700	11	10	7.4	1027.0	2
	1300	11	2	6.1	1028.4	0
	1900	8	19	5.3	1030.1	0
5	100	9	37	7.0	1029.4	0
	700	9	23	8.2	1028.4	0
	1300	7	351	9.2	1026.7	0
	1900	8	339	7.9	1026.7	0
6	100	2	295	6.1	1025.0	0
	700	4	233	6.6	1025.3	0
	1300	6	254	12.9	1023.6	0
	1900	5	161	9.6	1023.3	0
7	100	3	244	10.6	1023.3	0
	700	6	337	9.5	1022.3	0
	1300	11	6	9.2	1021.3	0
	1900	15	12	8.1	1024.0	6
8	100	15	13	7.4	1025.3	3
	700	14	21	8.5	1025.0	4
	1300	14	22	9.3	1023.0	0
	1900	10	352	9.7	1020.9	9
9	100	8	321	8.5	1019.2	11
	700	11	313	5.9	1020.3	0
	1300	8	309	5.9	1021.3	0
	1900	6	315	5.3	1024.0	0
10	100	5	322	4.7	1026.7	0
	700	6	328	3.3	1029.1	0
	1300	8	16	7.4	1030.7	0
	1900	7	25	7.2	1030.7	0
11	100	9	47	8.5	1028.7	0
	700	11	63	10.0	1025.3	0
	1300	9	119	10.3	1020.3	0
	1900	13	139	11.5	1013.8	0
12	100	8	188	16.3	1007.7	13
	700	4	263	10.8	1006.4	9
	1300	1	263	9.4	1004.7	0
	1900	3	248	9.2	1004.7	0
13	100	12	335	7.0	1005.7	0
	700	10	341	5.6	1009.8	0
	1300	7	335	6.4	1013.1	0
	1900	9	344	3.0	1017.9	0
14	100	4	20	3.3	1019.6	0
	700	1	305	-0.4	1021.3	0
	1300	6	215	8.3	1020.3	0
	1900	6	206	7.6	1020.6	0
15	100	5	231	6.6	1020.6	0
	700	4	239	5.6	1022.3	0
	1300	2	238	11.1	1020.6	0
	1900	5	137	8.2	1020.6	0
16	100	7	120	10.5	1015.9	0
	700	11	160	16.3	1010.1	4
	1300	5	224	15.7	1004.7	16
	1900	7	194	14.7	1003.7	0

* electronic problems

(Continued)

Table 2: Meteorological Data

Jan 1991

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
17	100	8	229	12.8	1004.7	0
	700	7	271	8.7	1008.4	0
	1300	8	288	12.1	1010.8	0
	1900	5	263	9.3	1014.8	0
18	100	5	282	7.3	1016.5	0
	700	4	255	5.8	1017.2	0
	1300	7	263	11.9	1014.2	0
	1900	6	269	9.6	1016.9	0
19	100	7	278	7.1	1018.6	0
	700	4	272	5.5	1020.3	0
	1300	4	138	8.4	1016.9	0
	1900	4	177	8.3	1014.8	0
20	100	2	142	8.1	1007.4	0
	700	12	340	8.2	1000.6	24
	1300	4	295	10.4	1002.0	0
	1900	3	225	8.7	1003.7	0
21	100	7	232	8.8	1001.3	0
	700	9	256	7.8	1001.0	0
	1300	10	292	9.9	1003.3	0
	1900	11	6	5.5	1008.4	0
22	100	11	351	2.1	1010.8	0
	700	12	332	-1.5	1014.5	0
	1300	11	338	-0.9	1017.2	0
	1900	6	331	-3.0	1020.9	0
23	100	1	110	-3.4	1021.9	0
	700	4	181	-3.3	1022.6	0
	1300	5	200	5.1	1018.9	0
	1900	4	192	4.8	1018.2	0
24	100	4	226	4.8	1018.6	0
	700	5	254	5.1	1019.2	0
	1300	4	245	5.8	1018.9	0
	1900	3	228	3.1	1019.2	3
25	100	4	282	3.4	1017.9	0
	700	14	8	2.1	1023.0	0
	1300	12	353	0.9	1024.7	0
	1900	8	8	0.2	1026.3	0
26	100	6	42	1.2	1025.3	0
	700	7	41	2.9	1024.0	0
	1300	6	6	5.7	1020.9	0
	1900	0		1.4	1018.6	0
27	100	4	234	2.6	1017.5	0
	700	4	256	3.5	1019.2	0
	1300	2	64	7.1	1019.2	0
	1900	4	144	6.4	1017.9	0
28	100	2	195	8.4	1013.5	0
	700	3	283	7.4	1011.4	0
	1300	0		8.1	1011.4	4
	1900	3	321	5.9	1015.2	0
29	100	4	35	6.9	1017.2	0
	700	6	42	7.9	1018.6	0
	1300	1	320	9.8	1018.2	0
	1900	1	324	8.3	1017.2	0
30	100	3	253	8.5	1015.2	0
	700	6	202	9.5	1013.8	0
	1300	3	199	13.5	1011.1	0
	1900	7	195	13.4	1008.7	7
31	100	9	232	12.8	1006.7	0
	700	8	287	10.9	1010.4	0
	1300	8	303	10.8	1016.5	0
	1900	10	343	6.7	1024.7	0
		<u>Resultant</u>		<u>Mean</u>	<u>Mean</u>	<u>Total</u>
		3	332	7.3	1018.3	142

* electronic problems

(Sheet 2 of 2)

PART III: WAVE DATA

Wave data are collected from two Baylor staff gages (Gages 625 and 645), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 6 hr (more frequently during storms) beginning at 0100, 0700, 1300, and 1900 EST. The sampling rate is two times per second for four contiguous 34-min records.

Wave height H_{mo} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to magnetic tape.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{mo} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, or the presence of multiple wave trains containing nearly equal energy.

Table 3: Wave Data

Jan 1991

Day	Hour	645		625		111		630	
		Baylor	at 7+80	Baylor	at 18+60	Pressure Gage		Offshsr	Wvrdr
		Hmo.m	T.sec	Hmo.m	T.sec	Hmo.m	T.sec	Hmo.m	T.sec
1	0100	0.92	6.56	1.42	5.22	1.51	4.92	1.55	11.64
	0700	1.30	5.12	1.45	5.33	1.51	5.02	1.53	5.45
	1300	0.96	6.09	1.24	11.13	1.25	5.57	1.31	5.69
	1900	1.14	5.33	1.21	5.45	1.24	5.33	1.40	11.13
2	0100	0.99	5.45	1.03	10.67	1.10	10.24	1.21	5.12
	0700	1.09	5.82	1.18	5.69	1.29	6.56	1.32	5.57
	1300	1.08	4.49	1.19	7.11	1.33	9.14	1.41	6.92
	1900	1.26	5.82	1.25	5.95	1.33	6.24	1.48	5.82
3	0100	0.98	5.69	0.99	6.09	0.98	6.09	1.10	6.09
	0700	0.70	5.69	0.79	5.69	0.82	5.57	0.95	5.82
	1300	0.51	9.14	0.67	9.14	0.69	9.48	0.75	9.14
	1900	0.71	4.83	0.73	8.00	0.76	8.53	0.81	7.11
4	0100	0.50	10.24	0.65	8.53	0.65	10.24	0.68	9.14
	0700	1.30	4.83	1.14	4.66	1.20	4.66	1.50	4.92
	1300	1.36	5.82	1.32	5.57	1.45	5.95	1.73	5.69
	1900	1.19	5.69	1.20	5.82	1.18	5.82	1.31	5.82
5	0100	1.22	4.74	1.14	5.33	1.12	5.57	1.25	5.12
	0700	1.16	5.22	1.24	5.02	1.26	4.83	1.38	5.45
	1300	1.17	5.33	1.06	5.33	1.14	5.45	1.21	5.69
	1900	0.86	5.02	1.04	6.24	1.05	6.40	1.11	6.09
6	0100	0.75	6.40	0.81	6.56	0.85	6.24	0.96	6.09
	0700	0.48	9.14	0.60	6.56	0.65	6.09	0.74	6.24
	1300	0.41	9.14	0.46	9.14	0.51	8.83	0.60	9.14
	1900	0.44	9.14	0.48	8.83	0.49	9.14	0.62	9.14
7	0100	0.43	8.83	0.46	9.85	0.55	9.48	0.64	9.85
	0700	0.31	9.48	0.45	9.14	0.51	9.14	0.63	9.14
	1300	1.46	6.09	1.48	6.09	1.68	5.95	1.75	6.40
	1900	1.35	8.26	2.49	8.26	2.92	8.00	3.07	7.76
8	0100	1.46	8.53	2.76	8.83	3.10	8.53	2.98	8.83
	0700	1.40	8.83	2.42	8.00	2.86	8.83	2.77	8.53
	1300	1.50	8.26	2.67	9.85	3.14	8.83	*	
	1900	1.43	11.64	2.71	11.64	3.00	9.14	*	
9	0100	1.58	10.67	2.71	10.67	3.16	11.64	*	
	0700	1.51	13.47	2.57	12.19	2.93	12.19	*	
	1300	1.50	12.80	2.44	11.13	2.89	11.64	3.18	11.64
	1900	1.43	11.64	1.82	11.64	2.05	11.64	2.02	11.64
10	0100	1.27	11.13	1.52	10.24	1.80	11.13	1.80	10.67
	0700	1.28	10.67	1.41	10.67	1.50	10.24	1.50	10.67
	1300	1.35	6.09	1.52	10.67	1.66	10.24	2.23	5.69
	1900	1.10	10.67	1.20	10.24	1.23	10.67	1.34	10.67
11	0100	1.30	4.92	1.41	10.24	1.44	4.92	1.55	5.22
	0700	1.34	6.40	1.64	6.40	1.83	6.56	1.96	6.56
	1300	1.45	7.31	1.47	7.31	1.74	7.53	1.98	6.92
	1900	1.34	7.31	1.92	7.31	2.02	7.31	2.48	7.76
12	0100	1.38	8.83	2.25	8.83	2.51	9.14	2.63	8.53
	0700	1.36	9.14	1.68	9.85	1.88	9.85	2.14	9.48
	1300	1.19	8.83	1.38	9.14	1.42	9.48	1.53	9.48
	1900	0.95	9.14	1.17	8.83	1.24	9.48	1.29	8.83
13	0100	0.99	9.14	1.14	8.53	1.24	8.00	1.39	9.48
	0700	1.11	5.02	1.30	9.85	1.41	5.12	1.69	5.57
	1300	0.99	5.69	1.16	5.82	1.21	5.69	1.43	5.45
	1900	0.95	6.09	0.94	5.69	1.06	6.24	1.39	5.57
14	0100	0.81	5.45	0.85	5.82	0.89	5.45	1.03	5.69
	0700	0.62	6.09	0.70	6.09	0.84	6.09	0.81	5.69
	1300	0.35	16.00	0.56	9.14	0.58	9.48	0.68	9.48
	1900	0.36	16.00	0.51	8.00	0.59	9.14	0.65	8.53
15	0100	0.32	16.00	0.49	15.06	0.53	8.53	0.56	9.48
	0700	0.27	15.06	0.42	15.06	0.52	15.06	0.48	16.00
	1300	0.32	15.06	0.46	15.06	0.51	14.22	*	
	1900	0.34	14.22	0.46	15.06	0.48	15.06	0.56	15.06
16	0100	0.56	3.41	0.60	14.22	0.60	14.22	0.73	8.83
	0700	1.39	7.76	1.54	8.00	1.80	8.00	2.15	7.76
	1300	1.07	4.57	1.43	9.14	1.40	9.48	1.88	9.14
	1900	0.93	8.53	1.04	8.83	1.16	8.53	1.43	8.26

* Electronic problems

(Continued)

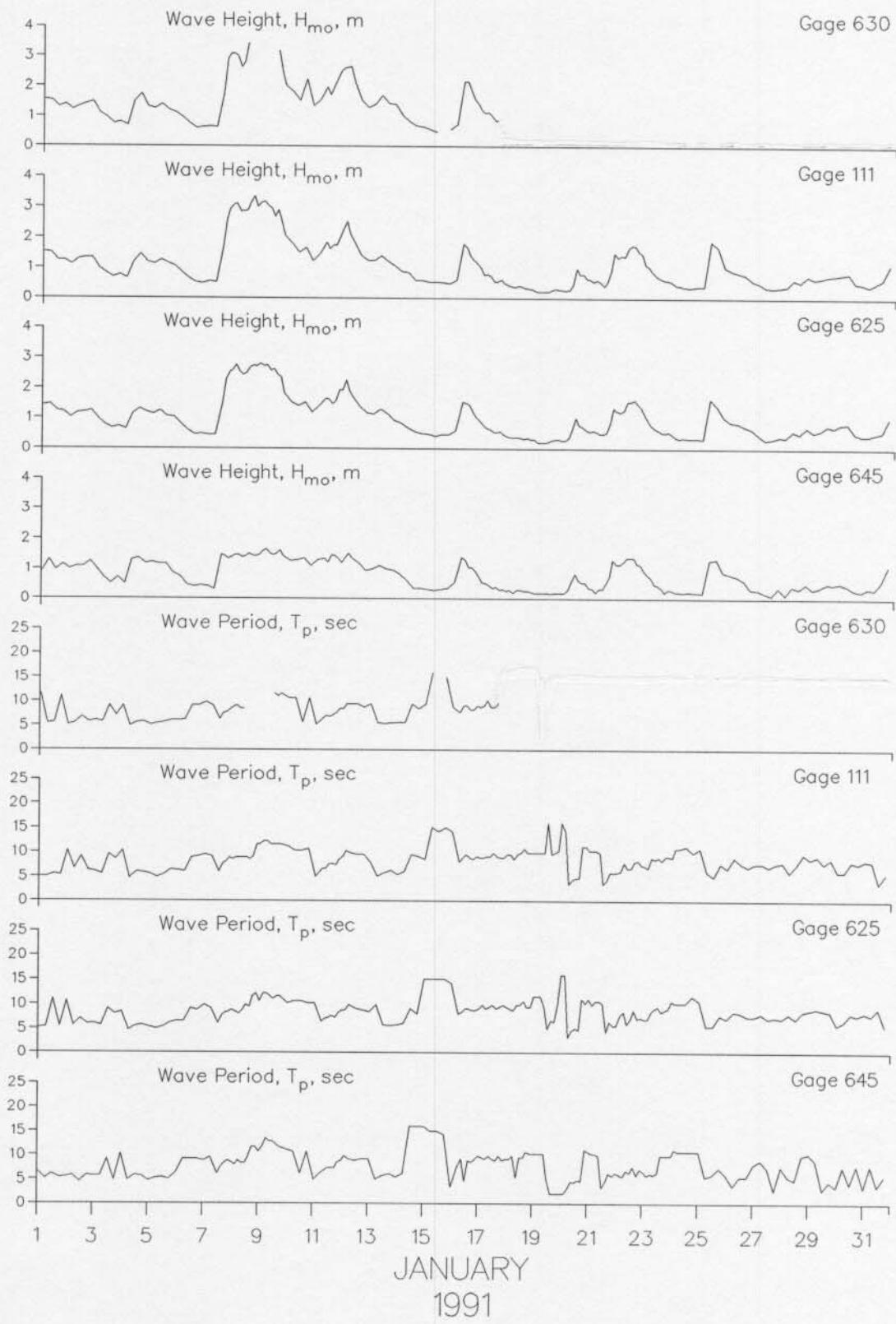
Table 3: Wave Data

Jan 1991

Day	Hour	645		625		111		630	
		Baylor at 7+80	Hmo.m T.sec	Baylor at 18+60	Hmo.m T.sec	Pressure Gage	Hmo.m T.sec	Offshrd Wvrdr	Hmo.m T.sec
17	0100	0.55	9.85	0.79	9.14	0.77	8.83	1.12	8.83
	0700	0.46	9.14	0.66	9.14	0.74	9.14	1.02	10.24
	1300	0.41	9.14	0.56	9.85	0.54	9.85		
	1900	0.31	9.85	0.47	9.48	0.50	8.83		
18	0100	0.29	9.14	0.38	9.48	0.39	9.48		
	0700	0.30	9.85	0.38	8.83	0.40	8.53		
	1300	0.27	9.48	0.33	9.85	0.33	9.85		
	1900	0.26	10.67	0.31	9.48	0.31	9.85		
19	0100	0.17	19.69	0.21	11.64	0.22	9.85		
	0700	0.19	18.29	0.21	18.29	0.23	18.29		
	1300	0.18	5.12	0.28	5.02	0.28	16.00		
	1900	0.25	18.29	0.30	6.40	0.29	9.85		
20	0100	0.12	18.29	0.28	16.00	0.25	16.00		
	0700	0.58	3.12	0.63	3.33	0.44	3.41		
	1300	0.62	4.41	0.78	5.12	0.79	4.66		
	1900	0.54	4.57	0.65	11.13	0.65	11.13		
21	0100	0.35	10.67	0.60	11.13	0.54	10.24		
	0700	0.34	10.24	0.49	10.67	0.53	10.24		
	1300	0.50	3.33	0.54	10.24	0.55	3.41		
	1900	1.31	6.24	1.34	6.40	1.48	5.82		
22	0100	1.14	6.40	1.22	5.69	1.42	5.82		
	0700	1.37	5.57	1.57	8.53	1.65	7.76		
	1300	1.37	6.40	1.61	6.92	1.72	6.74		
	1900	1.14	5.82	1.35	7.11	1.44	8.26		
23	0100	0.80	6.56	0.92	6.92	1.03	7.11		
	0700	0.48	6.09	0.68	8.53	0.75	8.83		
	1300	0.36	6.40	0.54	9.48	0.63	8.83		
	1900	0.31	9.85	0.55	8.83	0.58	9.14		
24	0100	0.24	9.85	0.38	10.67	0.43	8.83		
	0700	0.21	10.67	0.35	10.24	0.37	10.67		
	1300	0.22	10.67	0.34	10.24	0.35	11.13		
	1900	0.22	10.67	0.34	11.64	0.39	9.85		
25	0100	0.19	10.67	0.33	10.67	0.40	10.67		
	0700	1.29	5.45	1.65	5.57	1.88	5.95		
	1300	1.33	5.95	1.41	5.57	1.67	5.02		
	1900	0.88	7.31	1.04	7.76	1.04	7.53		
26	0100	0.82	5.95	0.89	7.11	0.92	6.56		
	0700	0.75	3.66	0.84	8.53	0.85	8.83		
	1300	0.62	5.45	0.74	8.26	0.77	7.53		
	1900	0.31	5.45	0.65	7.53	0.58	6.92		
27	0100	0.31	8.00	0.47	7.53	0.50	7.53		
	0700	0.19	8.83	0.30	8.00	0.36	7.53		
	1300	0.11	7.31	0.33	7.11	0.33	6.92		
	1900	0.36	2.67	0.39	7.31	0.36	7.53		
28	0100	0.13	7.53	0.38	7.11	0.38	7.76		
	0700	0.43	5.45	0.58	8.00	0.62	5.82		
	1300	0.33	4.83	0.50	6.92	0.53	7.31		
	1900	0.51	9.85	0.71	8.53	0.74	9.48		
29	0100	0.32	10.24	0.55	8.83	0.64	8.53		
	0700	0.38	8.83	0.61	9.14	0.67	9.14		
	1300	0.50	2.75	0.76	8.83	0.73	7.53		
	1900	0.48	4.49	0.71	8.53	0.76	8.53		
30	0100	0.53	3.37	0.81	5.82	0.78	5.95		
	0700	0.44	7.53	0.83	6.40	0.83	5.95		
	1300	0.30	3.94	0.52	8.00	0.51	8.00		
	1900	0.24	7.76	0.44	7.76	0.47	7.53		
31	0100	0.35	3.24	0.43	8.26	0.39	8.26		
	0700	0.31	7.76	0.49	7.76	0.51	8.00		
	1300	0.58	3.51	0.55	9.14	0.63	3.56		
	1900	1.10	5.57	1.00	5.57	1.11	5.57		
Mean		0.76	8.00	0.97	8.55	1.05	8.33	1.42	7.99
Std dev		0.45	3.51	0.61	2.56	0.70	2.64	0.65	2.41

* Electronic problems

(Sheet 2 of 2)



PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the data.

Table 4: Current Data
Jan 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter	
	Dye at (579 m) (surface)	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519
1 0100-Along Cross Result										23
1 0700-Along Cross Result	38 0 38	S 0 160	140	61 0 61	S 0 160	no observation				7 24 22
1 1300-Along Cross Result										8 21 24
1 1900-Along Cross Result										11 22 32
2 0100-Along Cross Result										14 35 38
2 0700-Along Cross Result	76 0 76	S 0 160	128	51 0 51	S 0 160	no observation				14 26 28
2 1300-Along Cross Result										12 34 36
2 1900-Along Cross Result										6 23 24
3 0100-Along Cross Result										7 23 24
3 0700-Along Cross Result	12 4 12	S on 179	120	12 8 14	S on 195	North	5	S		4 3 5
3 1300-Along Cross Result										14 11 18
3 1900-Along Cross Result										13 7 15
4 0100-Along Cross Result										16 8 18
4 0700-Along Cross Result	51 18 54	S on 179	no observation		no observation					17 4 17
4 1300-Along Cross Result										29 10 31
4 1900-Along Cross Result										16 4 16
5 0100-Along Cross Result										26 14 30
5 0700-Along Cross Result	38 19 43	S on 187	142	76 0 76	S 0 160	no observation				9 1 9
5 1300-Along Cross Result										19 10 21
5 1900-Along Cross Result										20 3 20
										151

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Continued)
Jan 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter	
	Dye at (579 m) (surface)	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	Speed
6 0100-Along Cross Result									11	S
6 0700-Along Cross Result	22 8 off 23 359	N off 359	126	22 4 off 22 351		no observation			7	off 13 128
6 1300-Along Cross Result									3	N
6 1900-Along Cross Result									2	on 4 10 306
7 0100-Along Cross Result									7	N 340
7 0700-Along Cross Result	61 21 on 65 179	S 0 on 29 160	130	29 0 29 160		no observation			9 4 10 5 3 6 129	10 316
7 1300-Along Cross Result									46 18 49	S off 139
7 1900-Along Cross Result									52 20 56	S off 139
8 0100-Along Cross Result									66 22 70	S off 142
8 0700-Along Cross Result	122 0 122	S 160	142	87 61 on 106 195		no observation			54 18 57	S off 142
8 1300-Along Cross Result									52 16 54	S off 143
8 1900-Along Cross Result									47 13 49	S off 145
9 0100-Along Cross Result									52 14 54	S off 145
9 0700-Along Cross Result	76 0 76	S 160	138	87 0 87 160		no observation			49 14 51	S off 144
9 1300-Along Cross Result									45 8 46	S off 150
9 1900-Along Cross Result									35 8 36	S off 147
10 0100-Along Cross Result									22 4 22	S off 150
10 0700-Along Cross Result	44 0 44	S 160	128	47 0 47 160		North	15	S	41 16 44	S off 139
10 1300-Along Cross Result									28 12 30	S off 137
10 1900-Along Cross Result									21 11 24	S off 132

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Jan 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements				Current Meter				
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	(500m Updrift)	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519
11 0100-Along Cross Result											27	S	
											2	off	
											27	156	
11 0700-Along Cross Result	24 9 on	S		55	126	0	S	no observation			32	S	
	26	179				55	160				16	off	
											36	133	
11 1300-Along Cross Result											23	S	
											13	off	
											26	131	
11 1900-Along Cross Result											19	S	
											5	off	
											20	145	
12 0100-Along Cross Result											16	S	
											3	on	
											16	171	
12 0700-Along Cross Result	10 0	N		61	140	0	N	South		18	N		
	10	340				61	340				8	S	
											0		
12 1300-Along Cross Result											8	160	
											4	S	
											0		
											4	160	
12 1900-Along Cross Result											17	S	
											2	off	
											17	153	
13 0100-Along Cross Result											14	S	
											9	off	
											17	127	
13 0700-Along Cross Result	102 0	S		68	140	0	S	no observation		40	S		
	102	160				68	160				15	off	
											43	139	
13 1300-Along Cross Result											18	S	
											3	on	
											18	169	
13 1900-Along Cross Result											50	S	
											14	off	
											52	144	
14 0100-Along Cross Result											20	S	
											4	off	
											20	149	
14 0700-Along Cross Result	41 0	S		22	128	0	S	no observation		36	S		
	41	160				22	160				17	off	
											40	135	
14 1300-Along Cross Result											3	N	
											1	on	
											3	322	
14 1900-Along Cross Result											7	N	
											10	on	
											12	285	
15 0100-Along Cross Result											12	N	
											8	on	
											14	306	
15 0700-Along Cross Result	21 11 off	N		0	116	7	off	South		3	N		
	24	7				7	70				10	N	
											5	on	
											11	313	
15 1300-Along Cross Result											10	N	
											2	on	
											10	329	
15 1900-Along Cross Result											0		
											4	off	
											4	70	

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
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 on = onshore off = offshore

Table 4: Current Data (Continued)
Jan 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
16 0100-Along Cross Result										5	S
										2	on
										5	182
16 0700-Along Cross Result	61	N		51	N			0	South	3	N
	15	on		13	on					5	on
	63	326		52	326					6	281
16 1300-Along Cross Result										6	N
										6	on
										8	295
16 1900-Along Cross Result										4	N
										3	on
										5	303
17 0100-Along Cross Result										1	S
										5	on
										5	239
17 0700-Along Cross Result	14	S		0						5	N
	8	off		8	off					3	off
	16	129		8	70					6	11
17 1300-Along Cross Result										7	S
										3	off
										8	137
17 1900-Along Cross Result										16	S
										6	off
										17	139
18 0100-Along Cross Result										5	S
										2	on
										5	182
18 0700-Along Cross Result	5	S		0						9	N
	13	off		6	off					6	on
	14	91		6	70					11	306
18 1300-Along Cross Result										9	N
										7	on
										11	302
18 1900-Along Cross Result										3	N
										4	on
										5	287
19 0100-Along Cross Result										12	S
										4	off
										13	142
19 0700-Along Cross Result	30	S		8	S					5	N
	6	off		2	off					3	on
	31	149		8	143					6	309
19 1300-Along Cross Result										0	
										0	
										0	
19 1900-Along Cross Result										12	N
										5	on
										13	317
20 0100-Along Cross Result										3	N
										1	on
										3	322
20 0700-Along Cross Result	76	S		68	S			0	North	9	N
	27	on		41	on					1	off
	81	179		79	191					9	346
20 1300-Along Cross Result										2	N
										1	off
										2	7
20 1900-Along Cross Result										2	S
										1	on
										2	187

KEY = All speeds in cm/sec
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 on = onshore off = offshore

Table 4: Current Data (Continued)
Jan 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
21 0100-Along Cross Result										8	S
										1	off
										8	153
21 0700-Along Cross Result	10 17 20	S off 100		116	5 11 12	N off 43		North	3 S	8 4 9	N on 313
21 1300-Along Cross Result										26 8 27	S off 143
21 1900-Along Cross Result										35 13 37	S off 140
22 0100-Along Cross Result										43 17 46	S off 138
22 0700-Along Cross Result	102 10 102	S off 154		140	0 0 0			no observation		39 14 41	S off 140
22 1300-Along Cross Result										39 12 41	S off 143
22 1900-Along Cross Result										22 12 25	S off 131
23 0100-Along Cross Result										15 9 17	S off 129
23 0700-Along Cross Result	10 2 10	S off 151		140	6 3 6	S off 129		North	1 S	8 10 13	S off 109
23 1300-Along Cross Result										1 5 5	N on 261
23 1900-Along Cross Result										10 10 14	N on 295
24 0100-Along Cross Result										13 8 15	N on 308
24 0700-Along Cross Result	9 13 16	N off 36		142	7 6 9	N off 22		North	1 S	15 10 18	N on 306
24 1300-Along Cross Result										9 8 12	N on 298
24 1900-Along Cross Result										9 6 11	N on 306
25 0100-Along Cross Result										7 3 8	N on 317
25 0700-Along Cross Result					no observations were made					32 12 34	S off 139
25 1300-Along Cross Result										34 11 36	S off 142
25 1900-Along Cross Result										38 15 41	S off 138

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
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 on = onshore off = offshore

Table 4: Current Data (Continued)
Jan 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	Speed	Dir
26 0100-Along Cross Result										32	S
										11	off
										34	141
26 0700-Along Cross Result	41 8 on	S	152	28 8 on	S	South	2	S		32	S
	41	171		29	177					15	off
										35	135
26 1300-Along Cross Result										25	S
										6	off
										26	147
26 1900-Along Cross Result										6	S
										6	off
										8	115
27 0100-Along Cross Result										5	N
										0	
										5	340
27 0700-Along Cross Result	17 9 off	N	128	0 4 off		North	2	S		9	N
	19	7		4	70					3	on
										9	322
27 1300-Along Cross Result										10	N
										3	on
										10	323
27 1900-Along Cross Result										2	S
										0	
										2	160
28 0100-Along Cross Result										6	N
										5	on
										8	300
28 0700-Along Cross Result	15 9 off	N	128	41 12 off	N	South	13	N		5	N
	18	11		42	357					4	on
										6	301
28 1300-Along Cross Result										8	N
										3	on
										9	319
28 1900-Along Cross Result										6	S
										3	off
										7	133
29 0100-Along Cross Result										7	S
										0	
										7	160
29 0700-Along Cross Result	0 5 on		128	20 4 off	N	South	3	N		8	S
	5	250		21	351					5	off
										9	128
29 1300-Along Cross Result										6	S
										3	on
										7	187
29 1900-Along Cross Result										10	S
										5	off
										11	133
30 0100-Along Cross Result										7	S
										3	off
										8	137
30 0700-Along Cross Result	20 10 off	S	128	24 7 off	N	South	10	N		29	S
	23	133		25	357					9	off
										30	143
30 1300-Along Cross Result										9	S
										9	off
										13	115
30 1900-Along Cross Result										11	S
										3	off
										11	145

KEY = All speeds in cm/sec
N = Northward, Shore parallel
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on = onshore off = offshore

Table 4: Current Data (Concluded)
Jan 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter	
	Dye at (579 m) Speed	Dye at Zone (surface) Dir	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	
31 0100-Along Cross Result								3	S	
31 0700-Along Cross Result	30 9 32	S off 143	140	14 3 14	S off 149	North	3 S	3 3 4	N on 295	160
31 1300-Along Cross Result								19 16 25	S off 120	
31 1900-Along Cross Result								17 15 23	S off 119	

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves) are taken daily at the seaward end of the pier. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests at approximately the same location as the visual measurements. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are also taken daily at the seaward end of the pier. A jar along with a thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The jar is removed, the temperature read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the surface visibility.

Table 5: Supplemental Observations

Jan 1991

Day	Time	Wave Approach		Radar Wave Angle deg from True N	Width of Surf Zone.m	Water Characteristics at Pier End		
		Primary	Secondary			Temp., C	Density g/cc	Secchi Vis., m
1	1345	25		80	134	11.1	1.0242	1.2
2	1000	10	70		67	10.0	1.0226	2.4
3	0830	30			73	10.0	1.0204	2.4
4	0850	20		45	82	10.0	1.0200	2.4
5	0715	35		95	108	9.4	1.0200	1.8
6	0910	110			46	9.4	1.0213	1.2
7	1005	350			59	10.0	1.0214	3.4
8	0815	60		70	197	8.9	1.0180	0.9
9	0715	349		70	250	9.4	1.0213	0.9
10	0745	30	70	70	171	8.3	1.0232	0.6
11	0730	60		70	146	8.3	1.0230	0.9
12	0745	90			158	8.9	1.0251	
13	0800	25		50	161	8.9	1.0230	0.6
14	0730	35			110	7.8	1.0200	1.2
15	0827	104			8	9.0	1.0230	1.8
16	0845	90		95	197	9.4	1.0240	0.3
17	0805	130		100	52	9.4	1.0254	0.9
18	0750	none visible			10	9.5	1.0248	1.2
19	0804	none visible				8.3	1.0220	1.8
20	0735	none visible		70	38	8.9	1.0238	0.3
21	0814	110		100		9.4	1.0246	1.5
22	0740	30		60	96	8.3	1.0228	0.3
23	0835	50			116	7.8	1.0222	2.4
24	0835	none visible			51	8.5	1.0234	1.5
25	0814	30	25	45	167	8.3	1.0242	0.3
26	0906	60			174	6.7	1.0206	1.5
27	0805	none visible				8.9	1.0210	1.8
28	0824	none visible				7.8	1.0220	2.4
29	0813	none visible		inoperative		7.8	1.0210	3.7
30	0838	none visible				8.3	1.0210	2.4
31	0825	none visible				8.9	1.0240	2.1

PART VI: WATER LEVELS

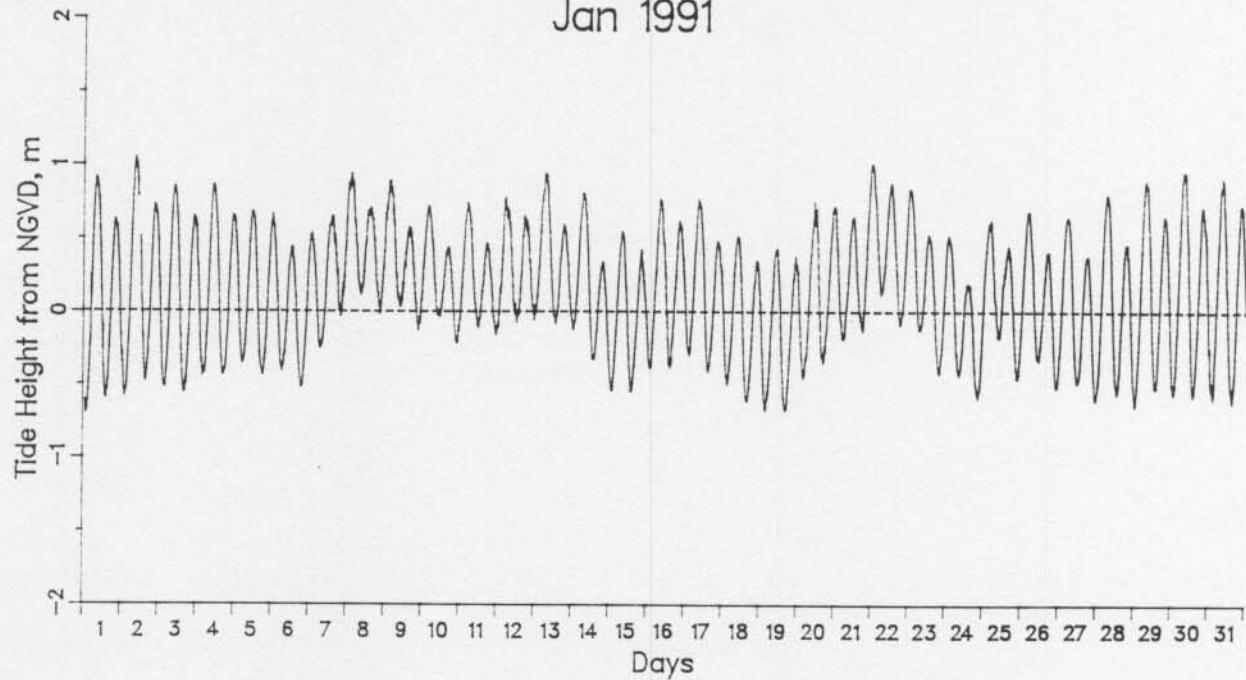
Since 1978, the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) has operated a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect instantaneous water level data every 6 minutes throughout the month.

The variation in water level during the month is shown in Figure 4 along with a list of mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water level.

Table 6 contains the time at the center of each 12.42-hr tidal cycle and the range, high, low, and mean water levels during each tidal cycle.

FRF Tide Heights

Jan 1991



Monthly Water Levels, m NGVD

Extreme Low = -0.69 on day 1 at 42 EST
Extreme High = 1.01 on day 21 at 2254 EST
Monthly Mean = 0.15
Mean Low = -0.38
Mean High = 0.65
Mean Range = 1.03

Table 6: Water Levels.m NGVD

		Jan 1991			
	Mid-Cycle Day	Low	High	Mean	Range
	Time				
1	612	-0.69	0.91	0.16	1.60
1	1837	-0.59	0.62	0.02	1.21
2	703				
2	1928	-0.48	0.73	0.13	1.21
3	753	-0.52	0.85	0.17	1.37
3	2018	-0.56	0.64	0.05	1.20
4	843	-0.44	0.86	0.22	1.30
4	2109	-0.44	0.65	0.11	1.09
5	934	-0.35	0.68	0.15	1.03
5	2159	-0.43	0.66	0.10	1.09
6	1024	-0.41	0.44	0.00	0.84
6	2249	-0.52	0.53	0.04	1.05
7	1115	-0.25	0.65	0.24	0.90
7	2340	-0.03	0.94	0.48	0.97
8	1205	0.12	0.70	0.41	0.59
9	30	-0.02	0.89	0.47	0.91
9	1255	0.03	0.57	0.29	0.54
10	121	-0.12	0.72	0.32	0.84
10	1346	-0.10	0.44	0.17	0.54
11	211	-0.22	0.74	0.28	0.96
11	1436	-0.11	0.46	0.16	0.57
12	301	-0.16	0.78	0.31	0.93
12	1527	-0.07	0.65	0.27	0.72
13	352	-0.06	0.94	0.46	1.00
13	1617	-0.08	0.59	0.23	0.67
14	442	-0.12	0.81	0.34	0.93
14	1707	-0.41	0.34	-0.03	0.75
15	532	-0.54	0.55	0.02	1.08
15	1758	-0.54	0.42	-0.07	0.96
16	623	-0.38	0.77	0.21	1.15
16	1848	-0.38	0.61	0.13	0.99
17	713	-0.36	0.76	0.23	1.12
17	1938	-0.46	0.48	0.03	0.94
18	804	-0.59	0.52	0.00	1.10
18	2029	-0.66	0.35	-0.15	1.01
19	854	-0.67	0.43	-0.12	1.10
19	2119	-0.67	0.37	-0.13	1.05
20	944	-0.43	0.75	0.14	1.18
20	2210	-0.35	0.72	0.22	1.06
21	1035	-0.18	0.65	0.22	0.83
21	2300	-0.13	1.01	0.51	1.13
22	1125	-0.09	0.88	0.43	0.97
22	2350	-0.12	0.84	0.36	0.96
23	1216	-0.41	0.53	0.13	0.93
24	41	-0.42	0.52	0.07	0.94
24	1306	-0.56	0.19	-0.15	0.75
25	131	-0.59	0.62	0.12	1.21
25	1356	-0.41	0.45	0.08	0.86
26	222	-0.45	0.69	0.17	1.14
26	1447	-0.47	0.41	-0.01	0.88
27	312	-0.52	0.65	0.11	1.16
27	1537	-0.56	0.38	-0.09	0.94
28	402	-0.60	0.80	0.14	1.40
28	1628	-0.56	0.46	-0.07	1.02
29	453	-0.64	0.90	0.19	1.54
29	1718	-0.52	0.65	0.05	1.17
30	543	-0.56	0.95	0.24	1.51
30	1808	-0.57	0.71	0.07	1.29
31	634	-0.59	0.91	0.16	1.50
31	1859	-0.61	0.73	0.08	1.34

PART VII: NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Geodimeter surveying system; a Geodimeter 140-T self-tracking, electronic theodolite, distance meter, in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in November 1990 and the two surveys in January 1991 on profile line 188, located 517 m south of the pier. Significant changes to the profile include an 60 m seaward migration of the nearshore bar (240 - 400 m) and a 20 m seaward shift of a berm on the beach face (80 - 120 m). Only minor changes are visible on the remainder of the profile.

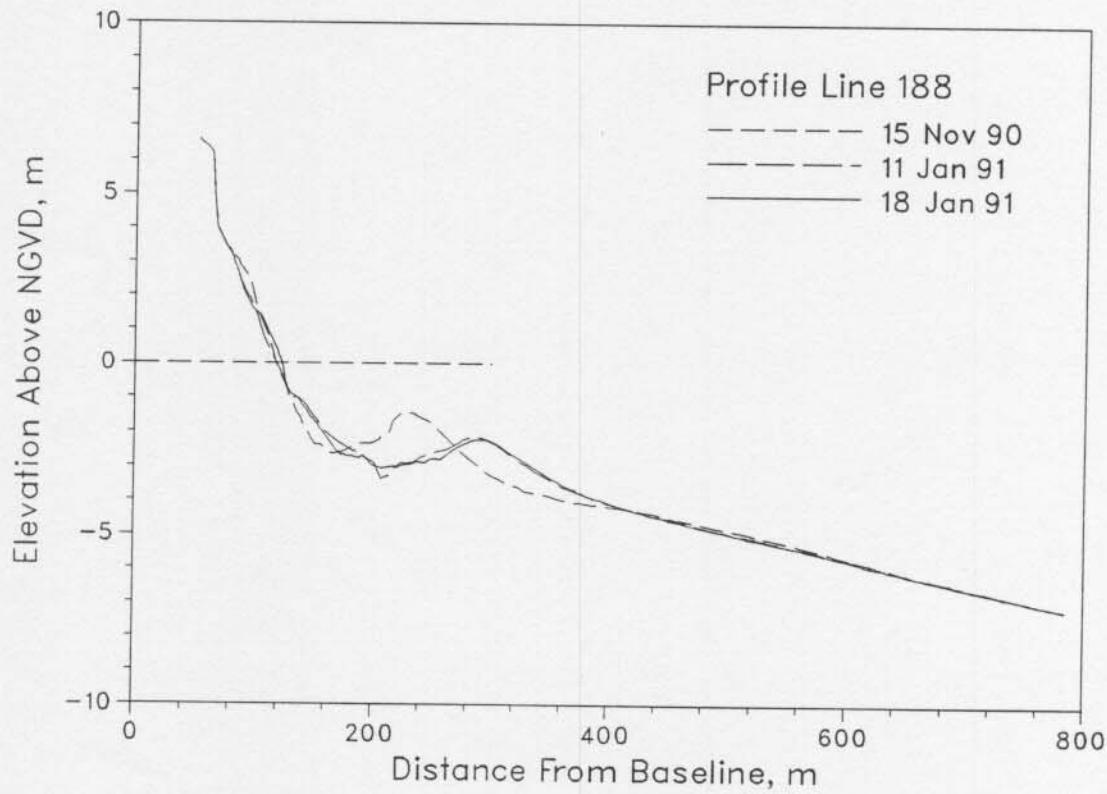


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1991.

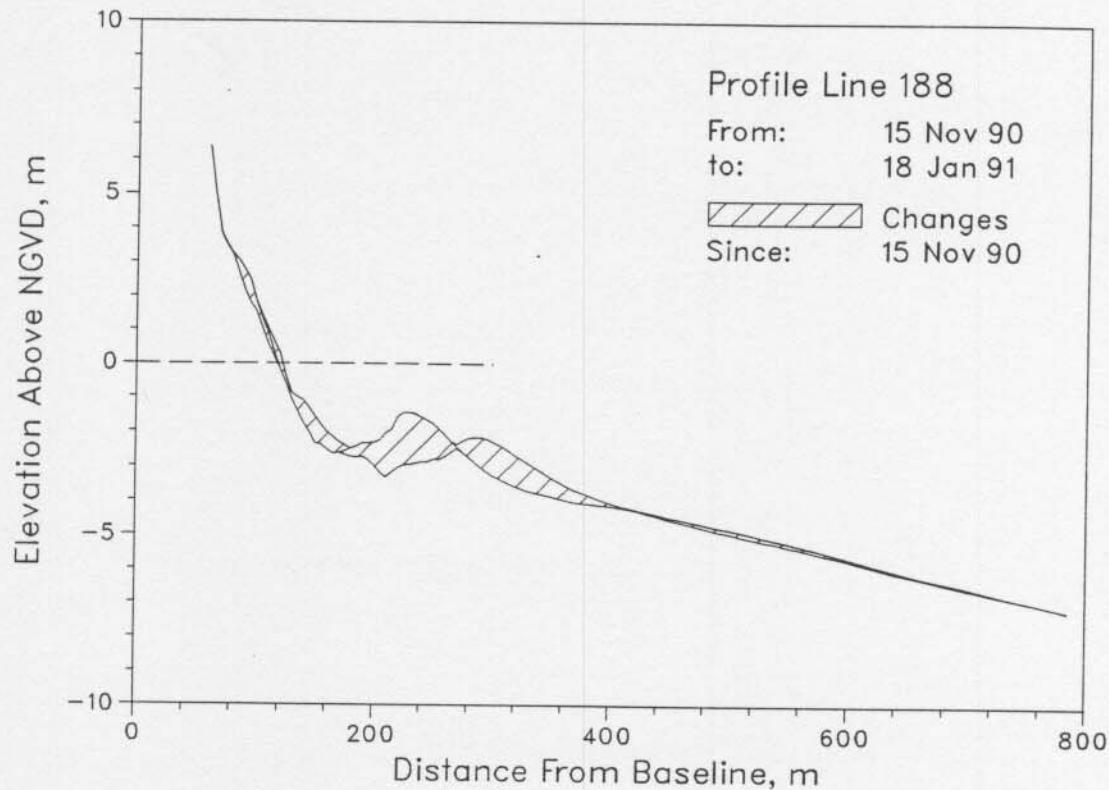


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey on 18 January. Wide contour lines on the change diagram represent eroded areas; thin lines indicate deposition.

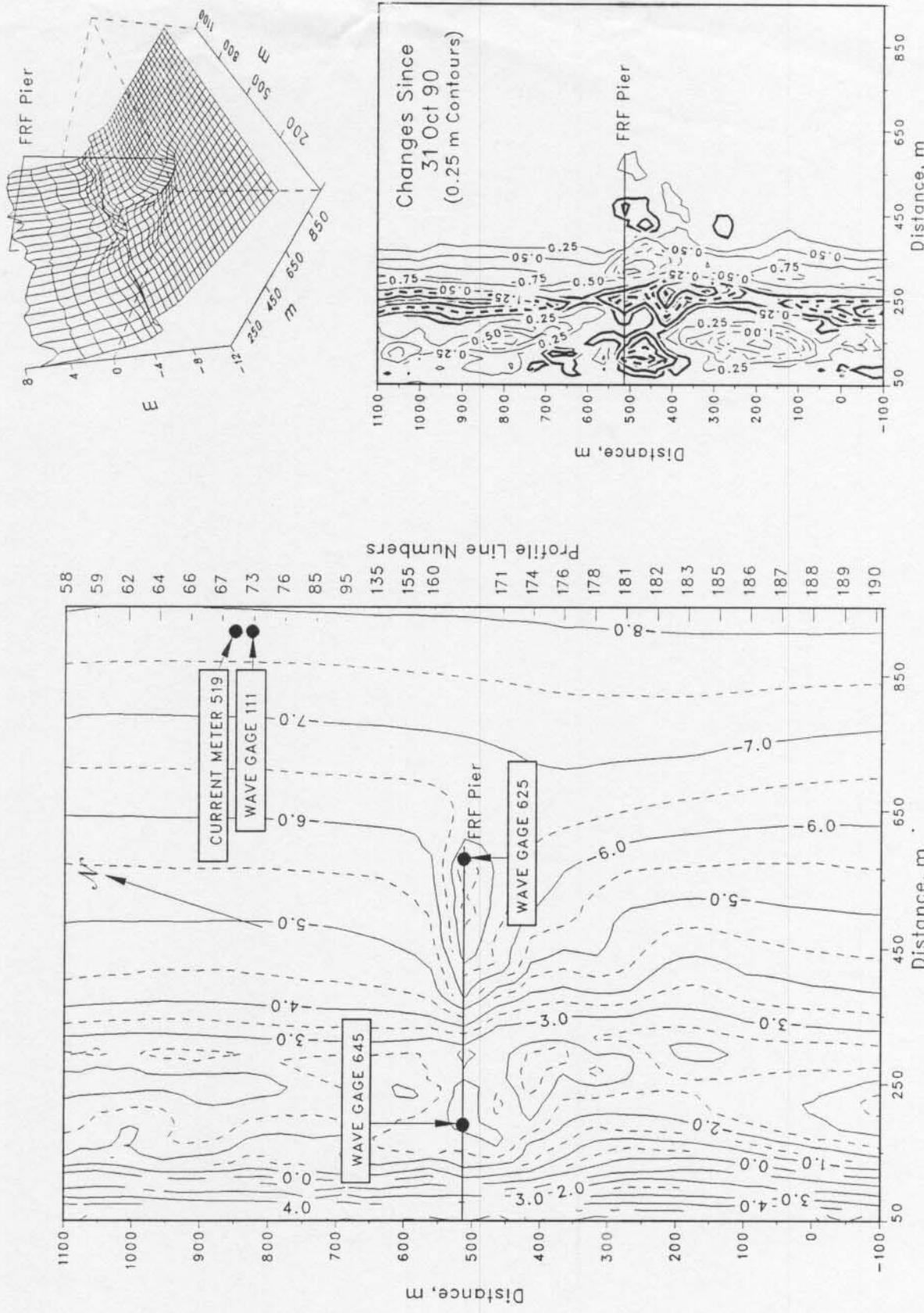


Figure 8. FRF bathymetry 18 Jan 91 depths relative to NGVD

PART VIII. SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the significant wave height at the seaward end of the pier (i.e. as measured near the end of the pier) exceeded 2 m and four contiguous 34 minute wave records were obtained every three hours:

<u>Start</u>	<u>End</u>
7 Jan (1600)	9 Jan (1708)
11 Jan (2008)	12 Jan (0242)

B. Storm Synopsis.

7-9 January - Winds from a strong Canadian high pressure system began to generate storm waves at the FRF late on 7 January. Developement of a weak coastal storm off the Georgia coast early on 8 January prolonged the period of onshore winds. The maximum H_{mo} (at gage 625) of 2.96 m ($T_p = 10.67$ sec) was attained at 2342 EST on 8 January. Maximum winds (from northeast) approaching 15 m/s occurred at 2042 EST on 7 January.

11-12 January - Following directly behind the storm on 8 January another Canadian high pressure system briefly regenerated storm waves at the FRF. Maximum winds (from southeast) exceeding 13 m/s peaked at 2042 EST on 11 January with the maximum H_{mo} (at gage 625) of 2.25 m ($T_p = 8.83$ sec) occurring early the next day at 0100 EST.

Distribution List

Government Agencies:

OCE	U.S. Geological Survey
BERH	U.S. National Park Service
NAO	U.S. Naval Academy
NASA/Wallops Flight Center	U.S. Naval Civil Eng. Lab
NOAA (NOS, NWS)	U.S. Naval Fac. Eng. Com.
SAD	U.S. Naval Oceanographic Off.
SAW	U.S. Naval Research Lab

Colleges/Universities:

California Inst. of Tech.	Stockton State College
East Carolina University	University of Akron
Florida Inst. of Tech.	University of Delaware
Harvard University	University of Florida
Naval Post Graduate School	University of Maryland
NC State University	University of Miami
Old Dominion University	University of North Carolina
Oregon State University	University of N. Colorado
Prince George's College	University of Rhode Island
Rutgers University	University of Virginia
Scripps Inst. of Oceanography	Va. Inst. of Marine Science
Southern Illinois University	

Others:

City of Va. Beach, VA	MEC Systems Corporation
Coastal Barge Corporation	Moffatt & Nichol, Eng.
Coastal and Est. Res., Inc.	Offshore Coastal Technologies
Coastal Science & Eng., Inc.	Mr. Rowland
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Queen's University, Ontario (Canada)
Ministry of Construction, Coastal Division (Japan)
Norwegian Hydrodynamic Laboratories (Norway)
University of New South Wales (Australia)
University of Sydney (Australia)